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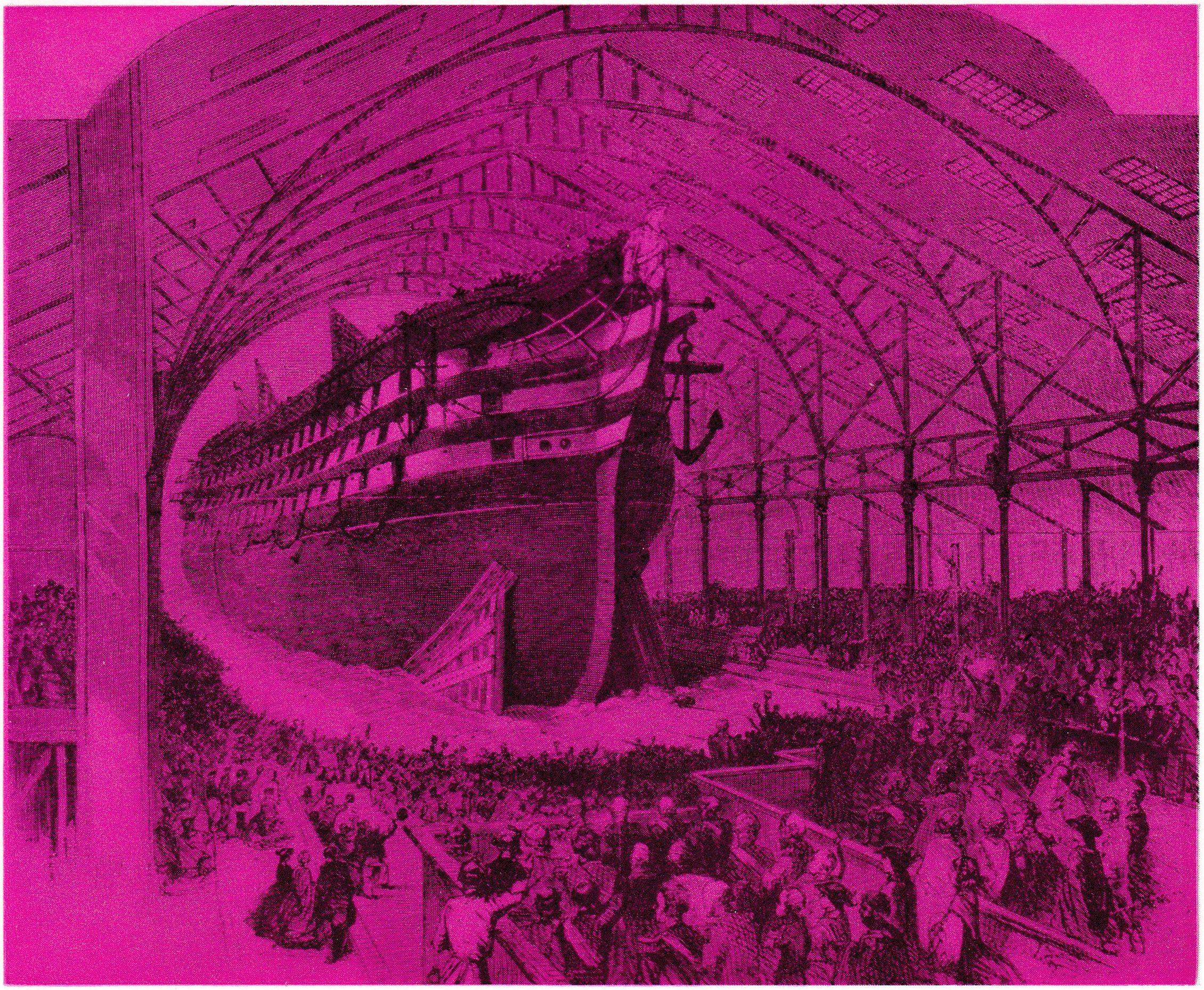
The Industries of Portsmouth in the Nineteenth Century



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Launch of H.M.S, Victoria at Portsmouth Dockyard.
An engraving in *The London Illustrated News*,
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Courtesy Victory Museum, Portsmouth.

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THE INDUSTRIES OF PORTSMOUTH IN THE NINETEENTH CENTURY

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If Portsmouth's dockyard remains an important component of manufacturing in the city today, then it is hardly surprising that naval shipbuilding should have dominated industrial activity in the nineteenth century. The writings of contemporary topographers attest to the size and by implication the importance of the dockyard, which by mid-century had become the largest royal dockyard; and the array of steam engines, foundries and other equipment therein certainly caught the imagination of both White's and Kelly's directories, to name but two. Indeed the yard was one of the largest manufacturing complexes in southern England, employing 5,628 men and 64 officers in 1867[1]. That upsurge of jingoism associated with the Dreadnought building programme proudly identified Portsmouth above all as a great naval dockyard and the 10,439 dockyardmen of 1910 as the most skilled of artisans.

Contemporary comment on manufacturing in the town was more muted, but the influence of the port and garrison was much in evidence. There were frequent references to activities, the most important of which was brewing, which benefited from the presence of so many sailors and soldiers of the garrison. The 1852 edition of Hunt's Directory asserts that rope-making was the principal manufacture, although it conceded that there were some half-dozen breweries in the town. Other industries often receiving a mention included baking, iron-founding and brick-making; that is, activities which were a direct result of the needs of the town. By contrast the clothing trades and shoemaking received scant attention, doubtless because the premises they occupied were hardly ostentatious. However, Hunt's Directory should be credited for noting in 1852 that the manufacture of ladies' stays gave employment to many females. Striking a realistic note, White's Directory for 1878 opines that 'The borough derives considerable support from its extensive dockyard and naval and military establishments, but these have prevented it from rising to that commercial importance to which it would have risen if the government would have allowed the construction of large Commercial Docks'. This is an important point, for it suggests that the presence of the dockyard, while emphasising the importance of some industries, at the same time was responsible for the weak development or absence of others.

Although useful in some senses, topographers' reports were doubtless biased, but until the 1841 census it is difficult to make anything other than generalisations as to the nature of manufacturing outside the dockyard walls. Directories are not exhaustive for they omit many small firms, while the use of Hearth Tax Returns, Court Leet Records and Apprenticeship Returns which Christie employs in his study of occupations in Portsmouth between 1550 and 1851[2], is at best a guide to reality. Even the use of the census reports does not provide an unambiguous solution since it is necessary to define the term manufacturing. The criteria employed by Booth[3] and modified by Armstrong[4] provide a satisfactory answer: manufacturing is held to be the transformation of one item into another of greater value, so that building and services such as banking and accounting are excluded. Dealers do not qualify, nor do general labourers who may or may not be employed in manufacturing, and those of independent means are also disregarded. Table 1 has been prepared using

TABLE 1

Manufacturing Employment in Portsmouth by Principal Sectors, 1841–1911

	1841		*1871*		*1911*	
	n	%	*n*	%	*n*	%
Shipbuilding	1,374	26.5	3,937	34.6	5,449	20.8
Metalworking and Engineering	375	7.2	911	8.0	6,179	23.6
Dress	2,352	45.1	4,390	38.5	10,373	39.6
Baking	210	4.1	454	4.0	615	2.3
Brewing	84	1.6	190	1.7	226	0.6
Other	771	15.5	1,480	13.2	3,325	12.8
TOTAL	5,166		11,362		26,167	

(Source: *Census Reports:* Occupation Tables)

these criteria. Unquestionably the most striking finding is the great importance of the dress sector, which includes milliners, dressmakers, staymakers, shirtmakers, seamstresses, tailors, hatters and shoemakers. Only hinted at by the directories and topographers, dress was already the leading sector in Portsmouth by 1841, and as fast as the town grew consequent upon the dockyard expansion, so the activity burgeoned. A large proportion of those in shipbuilding, metalworking and engineering in 1911 were dockyardmen, and yet at the very height of Dreadnought construction the dress industries were able to claim parity with the yard, putting the importance of the sector into real perspective. Brewing, such a favourite with contemporary observers, was never a large employer.

The significance of the dockyard in the shipbuilding, metalworking and engineering sectors can readily be established by comparing the totals of those employed in the yard with the census data, which refer to the town as a whole. In 1850 some 1,783 were engaged in

these trades in the yard out of a census figure of 1,822 for Portsmouth as a whole,[5] suggesting that at mid-century these occupations were singularly unimportant in the town. The same seems to have been true prior to the First World War. The 1911 census indicates that 11,628 were employed in the sectors under discussion in Portsmouth while some 10,900 were on the strength of the constructive and engineering sections of the Production Department in the dockyard in 1914[6]. Nineteenth-century manufacturing in Portsmouth therefore exhibits a neat dichotomy: shipbuilding, metalworking and engineering, which accounted for between 33% and 44% of industrial employment, were located in the dockyard, while the dress sector, claiming between 38% and 45% of the industrial workforce, was found in the town. Moreover, as Table 1 shows, four-fifths of manufacturing employment was involved in these two major sectors, and there are good grounds for believing that this also obtained prior to 1841.

The unimportance in the town of activities linked with the dockyard is at first sight anomalous. Had the dockyard been a commercial undertaking, it is not unreasonable to suppose that material and component suppliers would have developed in the town. But the Admiralty followed a policy of self-sufficiency and as far as possible endeavoured to rely upon outside contractors only for basic raw materials such as wood, hemp, iron, and later for engines, steel and armour plate. Even beer and biscuits were made in government establishments. The opportunities for Portsmouth industrialists to expand and prosper by virtue of dockyard supply contracts were therefore greatly circumscribed. In effect, manufacturing in the town was, with one important exception, restricted to supplying the population with food, drink, household articles, clothing and gas. The exception was the dress sector, especially stay and corset manufacture, which marketed its goods both locally and nationally. The success of the latter activity notwithstanding, the consequence of weakly developed manufacturing in the town was a very slow rate of capital accumulation. Wealthy manufacturers existed, as the Bonham-Carter, Long and Brickwood brewing families testified, but they were not numerous. The profits that would have accrued to the town had the dockyard been a commercial enterprise would have substantially added to the wealth of the locality. As it was, profits earned by the yard were purely nominal and represented a saving to the Admiralty rather than money available for local investment. It is surely no accident that there is in and around Portsmouth a notable absence of the large houses and surrounding estates so frequently found on the fringes of industrial towns fashioned in the nineteenth century; there are no parks created from gardens of the rich, nor a university endowed by philanthropically-minded industrialists.

SHIPBUILDING

With some justification the nineteenth century is frequently regarded as the era in which the factory system matured. In Portsmouth's dress sector this was not achieved until the latter part of the century, but by contrast the shipbuilding industry contained many of the elements of the factory system well before 1800, and in the years immediately following benefited from a series of innovations of a quite remarkable order. The great upsurge in expansion which gave the yard its unquestionable 'factory' overtones took place after 1770, although two docks – No. 5 or Great Stone Dock and No. 6 or North Dock – which survive today had been opened in 1698 and 1700 respectively. A number of existing storehouses date from this period, as does No. 4 Dock of 1772, the smithy (now the North Office Block) completed in 1791, and most spectacularly the Great Ropehouse of 1776, some 1,095 feet in length and the longest building in the world at the time.[7] By virtue of its structures, division of labour and the size of its labour force of 2,396 in 1802[8], there can be little doubt that the yard was a large eighteenth-century factory. Measured against the commercial shipbuilding industry it assumed enormous proportions, for in 1804 the biggest private yard, Perry and Walls at Blackwall on the Thames, employed 119 shipwrights[9] compared with 1,330 at Portsmouth in 1813[10]. Further, it is not unreasonable to see in the location of particular activities within the yard the rudiments of flow production techniques. Thus the southern part contained the principal storehouses including the sail loft and the hemp stores, together with the rigging house and the Great Ropehouse. The central sector contained the repair and refit facilities with timber stores, saw pits, carpenters' and joiners' shops. The northern part specialised in building with building slips, timber seasoning pits, saw pits and the smithy.

In the shadow of the yard stood Portsmouth's private builders. Enjoying the natural local advantages of a deep-water, sheltered harbour and the availability of timber from the New Forest and the Forest of Bere, as well as the undoubted demand for men-of-

war, private building might have been expected to flourish. Yet it was Bursledon, Buckler's Hard, Newport and Cowes that housed the busiest yards. Of the 60 ships listed by Carr Laughton as having fought in the French wars, only 9 were constructed by private builders in Portsmouth, against 16 at Bursledon and 16 at Buckler's Hard[11]. Doubtless the dynamic qualities of builders such as Adams at Buckler's Hard and White at Cowes, coupled with the negative effect of the dockyard on local shipbuilding initiative, were responsible for this situation. However ingenious they may have been, the building of rafts which floated submerged and which were much used by local smugglers, could hardly have been an important activity.

Almost inevitably the Napoleonic wars ensured that the dockyard should undergo modifications and extensions, but because the work carried out at the turn of the century was so innovatory, being associated with Samuel Bentham, it assumes particular interest. Bentham (1757–1831), the brother of Jeremy Bentham the philosopher, was appointed Inspector-General of Naval Works on 23rd March, 1796. Under him the Great Ship Basin, originally built in 1698, was enlarged and opened in 1801. It incorporated a novel feature, for rather than employing lock gates, a wooden caisson was preferred. To remove it water was simply hand-pumped from its interior. It had the great advantage of providing a roadway for wagons moving between the pitch-house jetty and the masting sheers jetty; a conventional lock gate could not have provided this facility and would have lengthened the distance between the two jetties by 500 metres. Two new docks, No. 2 (which houses the *Victory*) and No. 3, were completed in 1802 and 1803 respectively. The Old South Dock, now No. 1, was rebuilt in 1801. The sight of vessels lying marooned in the North and South Docks waiting for a spring tide to give adequate clearance over the mud was sufficient to cause Bentham to design a steam dredger which could lift 1,000 tons per shift from 28 ft at a cost of less than 1d per ton. It operated by means of an endless chain with buckets attached and was able to move by winching itself along its own anchor chains. Since a letter from Bentham to the Navy Board dated 13th May 1800 includes drawings of 'barges for depositing Mud', it is conceivable that he may have invented the hopper barge as well as the steam dredger[12].

As part of his programme for the improval of the efficiency of hitherto manual and horse-powered operations within the yard, Bentham had recourse to a number of steam engines. In 1797 he installed a 12-hp Sadler steam-engine to drive the dock pumps by night and the saw mills, to which he introduced the circular saw, by day[13]. In 1801 he designed 'a moveable steam engine equal in power to the incessant exertion of six Horses or thirty Men and applicable to the Unloading of Vessels, to the driving of Piles, to the Pumping of Water and to various other laborious Operations'[14]. This veritable panacea represented a great technical advance on the horse-powered capstans which drove pumps and on the two-man treadmills used to power cranes. Seeking both to improve the efficiency of production methods and remove the yard's dependence on outside suppliers, Bentham gained approval from the Navy Board in 1802 for the construction of metal mills adjoining the blacksmith's shop to supply copper sheathing for ship's bottoms[15]. The copper received was not merely reheated and rolled but further refined as well to ensure good quality; nails were also cast in the mills, which were powered by a 54-hp steam-engine and had a weekly capacity of 36 tons of sheet. It was estimated in 1805, a year after the mills opened, that they were making an annual saving of £4,000 in material costs[16], and together with improvements in the method of coppering itself there was an overall annual saving of £40,954[17], despite a workers' beer allowance of a gill a day[18]. The profits from this operation benefited the Navy Board, not Portsmouth, and similarly the town saw no income from the supply of equipment. Thus the boiler, stamping press, rollers and shears were supplied by William Whitmore of Birmingham, the cast-iron pipes for the furnace came from Deptford and the furnace castings were provided by Mr. Gould of Truro[19]. The only link between the yard and the local metal trades was that with Henry Cort who supplied mast-hoops, small anchors, bitts and knees from his technically advanced forge at Funtley near Fareham after 1780[20], but this did nothing to help Portsmouth. The town's poorly developed metal industry is reflected in the short supply of skilled workmen for the metal mills, causing Bentham to ask Maudslay in London to help with recruitment. Mr. Beach, the master of the metal mills, himself journeyed to Birmingham to procure skilled men and his success may be judged by the strength of complaints that refiners were being seduced from Birmingham by the yard[21].

In terms of the history of technology, the greatest innovation in the dockyard in the nineteenth century was the installation of a series of machine tools for the mass production of rigging pulley blocks between 1803 and 1809. Bentham had made a special study of

woodworking machines, culminating in his patent of 1793, and he was therefore quickly able to see the great potential of the drawings for pulley blocks submitted to him in 1801 by Marc Isambard Brunel (1769–1849). Brunel had offered his designs to Samuel Taylor at Southampton, the principal supplier of blocks to the Navy Board, but Taylor would not accept that his father's machines could be bettered. The Navy Board accepted Bentham's recommendation that Brunel's designs be taken up, and the task of building the machines was entrusted to Henry Maudslay. Maudslay was the only engineer capable of making the machinery, such was the sophistication of Brunel's work, and although it took him until 1809 to complete the task the success and longevity of the machinery is at least as much a tribute to him as to Brunel[22].

Brunel's machines, which have been comprehensively described by Gilbert[23], were outstandingly efficient, enabling 10 unskilled men to undertake the work of 110 skilled blockmakers, and many were still in use until the later 1960s. The mortising engine of 1803, now in Southsea Castle Museum, was the largest machine tool to have been constructed entirely of metal. By reducing the demand for labour required to produce a given number of blocks, the machinery ensured that the number of workmen in the block mills was kept to a low level; in 1849, when 26,908 single blocks and 9,878 double blocks were made, only 19 men and 9 boys were required[24]. Portsmouth's wages from block-making were negligible, but worse, the town saw nothing of the profit generated. The annual saving to the Navy Board was £17,664, and costs were met after only four years, hinting at the profits made by the Taylor family before their contract was rescinded in 1803.

Perhaps less remarkable but nevertheless important contributions to the dockyard were also made by Bentham. His proposals for the standardisation of mast sizes, for the relation of mast purchases to the rate of consumption, and for the construction of a mast pond with sections for different sizes of timber, resulted in major savings. He recommended adding walls, windows and gas lighting to the existing roofs of the building slips since the savings from sheltering ships from inclement weather were greater than the cost of the modifications. An 1853 report noted that Nos. 3, 4 and 5 Docks as well as five building slips were housed over, so that Bentham's ideas were obviously heeded[25]. Recognising the damage caused by fire to the wooden buildings in the yard, in 1800 Bentham constructed an 840-ton capacity water tank from which pipes ran round the yard, and by paying 'chip money' in lieu of the dockyardmen's right to take home chips less than three feet long, he saved further sums of money. Stationing himself at the yard gates, he had bought some chips from workmen and had discovered that they fitted together to form complete spars and planks which had been sawn up for chips[26]. Many of the poorer houses in Portsea were found to contain stairs just under three feet wide and doors, shutters and cupboards were fashioned from wood of similar dimension.

Bentham almost single-handed introduced the age of iron and steam into the dockyard. To assist him he appointed a small team of technical assistants including Samuel Bunce, architect, Mr. Rehé, mechanist, Mr. Barr and Richard Upsall, draughtsmen. He recruited Simon Goodrich, who in 1813 was appointed Mechanist to the Navy Board, and Joshua Field, who in 1804 left the yard to join Maudslay and eventually to become his partner. Indeed there is ample support for Marsh's view that had Bentham not been dismissed in 1805, he and Goodrich would have made Portsmouth the principal naval centre for pioneer work in steam and metallurgy[27]. In this they would have been assisted by the presence of the Royal Naval College and the School of Naval Architecture. As it was Woolwich assumed the mantle of leader and the Steam Factory there was inaugurated in 1840, nine years before Portsmouth's corresponding building.

The policy of self-sufficiency adopted by Bentham and the Navy Board was not restricted to the products of the metal, saw and block mills. Smiths had been employed since 1726 and rope-making was even longer established. As late as 1850 there remained 120 spinners and 96 ropemakers, effectively removing the opportunity for local rope manufacturers to sell to the Navy. The existence of the metal, saw and block mills likewise reduced the scope for Portsmouth enterprises, and it is unrealistic to suppose that the town could have supplied items such as steam engines in the early nineteenth century, for these were the province of the large industrial towns and firms like Fenton Murray of Leeds who supplied the 30-hp engine for the block mills. However, it might have been expected that sails, cordage, tar brushes, ballast buckets, trenails, paint and lamps could have been provided by Portsmouth firms. That they were not was due to the absence of a commercial shipbuilding tradition. After all, there was not a single shipwright (a trade that required a seven-year apprenticeship) in the town outside the dockyard in 1804; even Gosport

had four merchants' yards with a total of 37 shipwrights[28].

However much Portsmouth dockyard was popularly associated with the construction and fitting out of men-of-war during the Napoleonic period, the fact remains that it was Navy Board policy at this time for the majority of new ships' hulls to be put out to private yards and for the yard to be responsible for fitting out, repairs and refits. Thus in 1812 some 79 ships docked for repairs, 134 were worked on at Spithead and 31 in the Harbour, but only 13 were launched, of which 9 were sixth-rate and 3 were fifth-rate[29]. Data available for the number of man-days spent building and repairing by shipwrights in the yard enable a ratio of building to repairing to be calculated. In 1796 the ratio was 100, that is, 100 times more man-days were spent on repairing than on building. By 1800 the ratio had fallen to 47, a trend which continued, giving ratios of 18 in 1810 and 4.5 in 1820. Clearly, although repairing was the more important activity, building was growing in stature, and while only two first-rates, *Dreadnought* in 1801 and *Boyne* in 1810, were launched in the first two decades of the century, the Navy Board seemed to be reversing its earlier policy. In 1830 building was more significant than repair work, although the trend was not maintained and by 1840 the ratio had risen to 4.20[30].

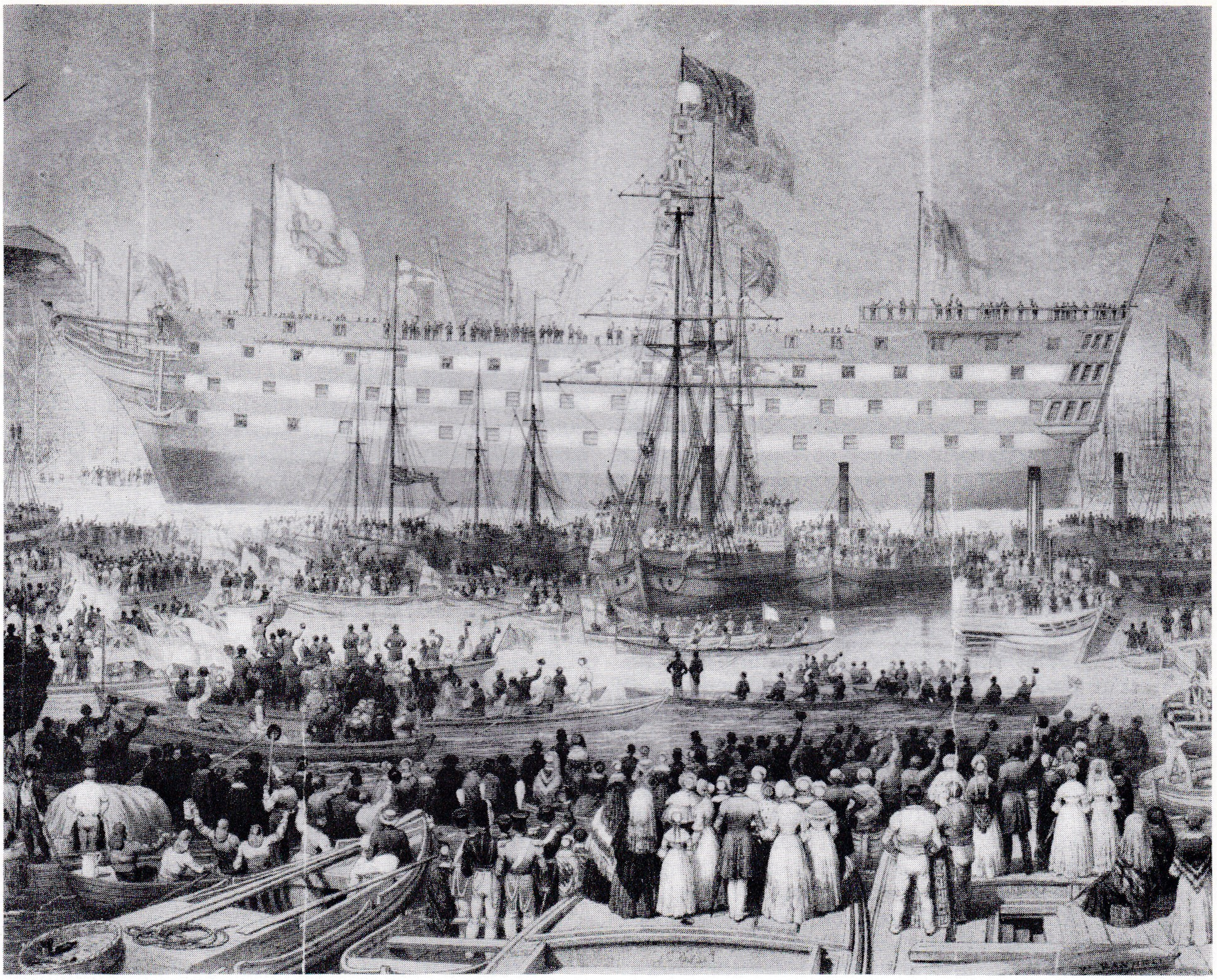
The end of the war resulted in an immediate contraction of the yard labour force. From a peak of 3,582 men in 1813 the establishment was reduced to 2,200 in 1822 and further cut to 1,610 in 1830[31]. Apart from the distress caused by these redundancies, the reduction of the wages of those remaining in employment also helped to undermine the town's economy and did little to provide incentive either for the expansion of existing industry or for the birth of new manufacturing. The ending of chip money in 1830 saved the Navy Board £8,000 per annum, but it also took this sum of money out of the town. The extensive use of convicts in the yard, begun in 1800, was a constant source of bitterness among the townspeople, for convicts occupied labouring jobs which would otherwise have gone to local men. In 1828 for example, 100 labourers were dismissed and the horse contract cancelled; convicts replaced both the labourers and the horses used on the dockyard tramway system[32].

These employment changes were associated with the cutting back of repair and refitting work and the greater emphasis on building. Between 1802 and 1811 some 8,613 tons were launched, but the years from 1812 to 1821 accounted for 12,708 tons, while 14,099 tons were launched between 1822 and 1831[33]. The time spent by shipwrights on building increased very much more rapidly than the rise in the tonnage launched. Certainly it had always been accepted that five years were necessary for the satisfactory completion of a first-rate, but one suspects that after the war the yard was resting on its laurels. For instance, *Princess Charlotte*, a first-rate, was laid down in 1812 but was not launched until 1825, and the *Indus*, an 80-gun ship begun in 1819, remained on the slips until 1839[34]. Experiments in steam propulsion begun at Portsmouth in 1821 may have been a contributory cause of the apparently low productivity, although it has to be observed that steam was introduced into the Navy very slowly and the first steamship to be launched at Portsmouth was not completed until 1835. This was the 220-hp wooden paddle steamer *Hermes*, a 6-gun vessel of 712 tons, coppered in Portsmouth, but engined on the Thames appropriately enough by Maudslay and Field. The *Hermes* was followed by other paddlers whose names suggested their very different nature: *Volcano*, *Stromboli*, *Driver*, *Thunderbolt* and *Firebrand*. It must have been an anguished time for Admiral Byam Martin, who remarked

> 'If, however, steam vessels take the place of our beautiful and graceful ships of war, then, indeed, chimney sweeps instead of seamen may be employed to sweep the ocean and other nations will have to rejoice in an equality with us, produced chiefly by English ingenuity'[35].

However Captain Napier, who set sail in 1820 in the *Galatea*, equipped with sails and manually powered paddle-wheels, capable of moving the ship at three knots provided 190 men had sufficient energy left to turn them, doubtless greeted the steam-engine rather differently[36].

The building programme of the late 1830s resulted in a slight improvement in the yard employment situation, giving a workforce of 2,227, representing 43% of Portsmouth's industrial population, in 1841. However welcome this may have been for the town, the introduction of steam-powered vessels could do little to encourage manufacturing, for the engines were made in the marine engineering areas of the period, and local engineering, such as it was, was scarcely in a position to contribute. The possibility of such a contribution receded with each increase in complexity of naval architecture, even though the self-sufficiency of the yard itself diminished with such



developments. Within the yard the acceptance by the Navy in 1840 of the superiority of the screw over the paddle-wheel, demonstrated in the epic tug-of-war between the *Alecto* and the *Rattler*, the latter powered by a twin-bladed screw, caused a number of frigates using this method of propulsion to be laid down in quick succession. The first to be launched was *Rifleman* in August 1846, subsequently engined on the Thames by Miller and Rosenhill. *Rifleman* displaced 483 tons, but later screw vessels were much larger as the advantages of the absence of paddle-wheels, which took up so much of the broadside, thus impairing fire-power, came to be fully appreciated. The 1,872-ton *Arrogant* was launched in 1848, the year the last sail warship, *Leander*, entered the water. She might have been the last of her kind, but *Leander*, not even a first-rate, was, at 1,987 tons, larger than any of the vessels manned by Byam Martin's chimney sweeps.

The arrival of steam and of much larger vessels caused plans to be drawn up for the construction of a steam basin, now No. 2 Basin. Built largely by convict labour, it was opened on 25th May 1848 by Queen Victoria, and the impressive Vanbrugh-like Steam Factory, 600 feet long, running the length of the western side of the Basin, was completed in the following year. Adjacent was the smithery, opened in 1852; and the iron foundry to the south-east of the Basin was completed in 1854, many of its architectural features reflecting the design of the Steam Factory across the Basin. Three docks were also built at this time. Although they were longer than earlier docks, they were still constructed to accommodate wooden-hulled steamships since iron had not yet been introduced into warships. Even though warships were still being engined by commercial firms, only the boilers being made in the yard, and the ironclad era had not yet arrived, the extensions of 1845–1854 unquestionably confirmed that the age of steam and iron had come to Portsmouth. Some 17 acres were added to the yard, the land formerly comprising the New Buildings district of Portsea, which not only had its own brewery but also held an annual mock mayoral election, during which a local company known as The Royal Snuffs marched up and down, and after which a fire was lit at Bonfire Corner.[37] Portsmouth lost some industrial activity and not a little peculiar culture, but to add insult to injury, when in 1851 the

The Launch of an Unidentified Vessel at Portsmouth in 1842.
Courtesy Portsmouth City Museum

Town Council mooted a scheme for the construction of commercial docks on the site of the Mill Pond, a project which might well have led to the development of new industries in the town, the Board of Ordnance ruled it 'entirely inadmissable'[38].

Concomitant with the expansion of the yard was a considerable rise in the numbers employed. The total strength in 1851 was 2,952, of whom some 462 worked in the Steam Factory, in terms of employment the largest industrial premises in Portsmouth; the ropehouse employed 216, the smithery 179 and the block mills 60. The census of that year records new trades such as boilermaker and engine-maker, occupations which together outnumbered that of sawyer, a trade once second in importance only to the key activity of shipwright. The 1850s witnessed the launching of the biggest wooden-hulled vessels ever to be constructed in Portsmouth. Hitherto only the 110-gun *Queen*, launched in 1839, had topped the 3,000-ton mark, but no fewer than eight of the 12 men-of-war leaving the slips between 1853 and 1860 were of this size. Two were more than 4,000 tons: *Marlborough* and the 131-gun *Victoria*, whose Maudslay and Field engines produced 1,000 hp. In their hull design, sails and armament, they closely resembled Nelsonian vessels, yet with their steam-driven propellers they belonged to another age which came increasingly to dominate shipbuilding practice. Their construction resulted in the recruitment of more men; but, as Table 2 indicates, in 1861 the town was less dependent on the dockyard for work than at any other time between 1841 and 1911, although every second male in industrial employment worked there.

The gathering speed of the technological revolution in shipbuilding caused the extensions of 1845–1854

TABLE 2
Contribution of the Dockyard to Manufacturing Employment in Portsmouth, 1841–1911

	Portsmouth Industrial Workers (*1*)	*Dockyard Workers* (*2*)	(*2*) *as* % (*1*)	(*2*) *as* % *Portsmouth Male Industrial Workers*
1841	5,166	2,227	43	58
1851	8,387	2,952	35	63
1861	13,489	4,314	32	51
1871	11,362*	5,628 (1867)	49	69
1881	14,317	6,300	44	68
1891	18,421	6,232	34	53
1901	20,131	7,976	40	59
1911	26,167	10,439	40	56

*Workers aged 20 and above only

(Sources: *Census Reports*, Occupation Tables, *R. S. Horne Papers*)

almost to be rendered obsolete before they were completed. Consequently, work began in 1864 on what was known as the Dockyard Extension. Initially the plan was to requisition 99 acres of land largely occupied by the fortifications and Pest House Fields, but this was quickly and dramatically increased to 261 acres in 1865. The bulk of the work was undertaken by convicts who were also put to the making of bricks from the local Stamshaw clay which was found to be excellent for dock engineering purposes. The spoil from the excavations was carried away by means of a light railway on piling and used to join Big Whale Island with Little Whale Island, the naval gunnery school arising out of their union. By 1876, when the Extension was complete, the area of the yard was nearly treble that of 100 years earlier, and the new boundary could be recognised, as it still can, by the stone wall along Flathouse Quay and Flathouse Road to Unicorn Gate. Within the yard, three docks, Nos. 9, 12 and 13, and four large basins, the Tidal, Fitting, Rigging and Repairing Basins, were built, the smithery was enlarged, a new iron-foundry was opened near Marlborough Gate, and there were new engine-houses, a brass-foundry, a coppersmiths' shop and a boiler smithery[39]. The day of the iron ship had indeed arrived. The first of these, *Royal Sovereign*, converted from a wooden-hulled vessel, had been launched from Portsmouth in 1864, the first warship in the Navy to have guns in revolving turrets, but still possessing sails. But by 1871 wood and sails had gone. In that year the 9,380-ton, twin-screw, *Devastation* was launched, her four guns in turrets, her hull protected by 12-inch armour plate and her masts serving only for signalling. These events resulted in the adaptation of the rigging house and the sail loft for other purposes, and the ropehouse was closed in 1868. Rope was still in use in the Navy, but henceforth it was supplied by Chatham dockyard. Apparently the Admiralty sent a spinning-jenny to Portsmouth, Chatham and Devonport on trial, but only the Chatham Master Ropemaker offered a favourable report. Possibly taking umbrage, the Admiralty promptly declared that the Portsmouth and Devonport roperies were superfluous[40]. Nevertheless, there was still no dockyard market for the commercial roperies in Portsmouth.

Despite the Dockyard Extension, the years between 1865 and 1874 were a period of reduced activity in the yard. *Devastation* apart, only one vessel of more than 1,300 tons was launched, the 6,040-ton *Shah* in 1870, and in total only 15 ships left the slips. Some 1,500 dockyardmen were dismissed in 1868, but

industries in the town were not capable of absorbing anything like this number of men. Consequently, a fund was set up to pay for the emigration of dockyard families. The Admiralty placed troopships at their disposal and 1869 and 1870 saw the departure of well over 1,000 Portsmuthians to Canada. Many must have reflected on the opportunities they would have had to remain had convicts not been used on the Extension and in the associated brickworks, one of the largest in southern England. Many local brickmakers doubtless felt more than a little aggrieved at the thought of profits that might have been. These were depression years and it was unfortunate that retrenchment by the Admiralty coincided with them. The Sea Lords did not feel that they could invest large sums of money in vessels which would quickly become obsolete, for the pattern of ironclad warship construction had by no means settled down. At the same time, defence priorities were very much in favour of fixed fortifications, as witnessed in the construction of the ring of forts round Portsmouth and Gosport in the 1860s[41].

The Dockyard Extension and the ever-developing technical advance permitted increasingly large vessels to be built at Portsmouth. *Inflexible*, a battleship of 11,880 tons including in her armament four 16-inch guns which must have made the cannon of the sail era look like toys, was launched in 1876. Others approaching this size included *Colossus* (1881), *Camperdown* (1885) and *Trafalgar* (1887). The upward trend was continued in the launching of *Royal Sovereign*, a battleship of 14,150 tons, in 1891. She carried no less than four 12-inch and ten 6-inch guns and was protected by waterline armour some 11 inches thick. From *Royal Sovereign* evolved the *Majestic* class of 15,000 tons displacement, fitted with engines developing between 10,000 and 15,000 hp. *Majestic* herself was launched in 1895, followed by *Prince George* the same year, *Caesar* in 1896, *Canopus* in 1897, *Formidable* in 1898 and *London* in the following year.

The rearmament programme taxed the resources of a yard even as large as Portsmouth, and since the number of building slips capable of accommodating a capital ship was restricted, building was also effected in the dry docks; *Royal Sovereign* was built in this manner. The increase in size of vessel necessitated the construction of larger locks giving access to the enclosed basins, and as part of the reorganisation that took place in the yard between 1888 and 1912 two large docks, Nos. 14 and 15, were opened in 1896. Impressive though the launchings were in the

TABLE 3

Tonnage Launched by Portsmouth Dockyard, 1861–1910

1861–1870	*1871–1880*	*1881–1890*	*1891–1900*	*1901–1910*
16,821	55,720	65,488	145,820	152,950

(Source: Calculated from Thomas, *op.cit.*, 129,148)

1890s – Table 3 quantifies the great spurt in output in this decade – Fisher's *Dreadnought* building programme, agreed in 1905, brought the Portsmouth yard to its apogee. Portsmouth was chosen to build not only *Dreadnought*, but also all the prototypes of the subsequent *Dreadnought* classes, that is, *Bellerophon*, *Neptune*, *Orion*, *King George V*, *Iron Duke*, *Queen Elizabeth* and *Royal Sovereign*. The Admiralty required that the pioneer work be executed in one of the royal dockyards, and since the advent of the telephone removed much of the advantage which Chatham once had in its proximity to London, the deep, sheltered waters of the Solent were enough to ensure Portsmouth's selection. Some 23% of Dreadnought tonnage was built in Portsmouth. The Clyde, arguably the leading shipbuilding district in the world at that time, accounted for 21%, and even this represented the combined totals of four separate yards[42]. These achievements were, however, short-lived, for after the launching of the 25,750-ton *Royal Sovereign* in 1917, no further capital ships were allocated to Portsmouth on account of the modest size of the yard's building slips.

During the eighteenth century, Portsmouth's commercial shipbuilders might have been engaged upon the construction of men-of-war, but in the following century their stature shrank almost to negligible proportions. Table 4 shows the tonnage launched and subsequently registered in Portsmouth, and while some ships built here were doubtless registered at other ports, the data nevertheless point both to the modest output and to the relatively small scale of the operations. The largest vessel, the 386-ton sailing ship *Dahlia*, built by J. T. Crampton in their Landport yard in 1878, was a mere quarter of the size of the third-rates launched by the Portsmouth firms of White, Bucknall and Hunt over a century earlier. Kelly's Directory for 1875 reported that John Read had a patent slip adjacent to the Camber Dock capable of accommodating vessels of up to 800 tons, but since the largest vessel built by Read and registered in Portsmouth displaced 125 tons, it is more than likely that this slip was used for repair work rather than for the construction of larger vessels. Lacking an engineering tradition, Portsmouth did not throw up men anxious to experiment with steam, and

TABLE 4

Tonnage of Vessels Launched and Registered in Portsmouth, 1830–1899

	Tonnage Launched	*Mean Size of Ship, tons*	*Largest Ship, tons*
1830–39	354	32	72
1840–49	2,773	44	219
1850–59	2,067	62	197
1860–69	2,108	51	226
1870–79	2,534	79	386
1880–89	371	31	60
1890–99	588	53	106

(Source: Board of Trade Registry of Shipping and Seamen Records, 1824–1917, Portsmouth Record Office)

the typical Portsmouth-built vessel was a small sailing coaster. Indeed the first steamship built and registered in the port was the 9-hp *Queen* launched in 1872; and the largest steam-powered vessel, the 70-ton *Southsea*, operated by the Southsea and Isle of Wight Steam Ferry Co., was rated at a mere 35 hp when she was launched in 1873. Crampton built three small steamships between 1875 and 1883, all displacing less than 32 tons, and the small engineering firm of H. Tipping in Portsmouth High Street built the 60-ton, 15-hp steamship *Lady Busk* in 1881; but far from raising the level of their technology, in the 1890s Portsmouth yards were obliged to retreat into the production of simple barges and hoppers. Crampton and Frank Bevis at Mile End, two of the largest remaining builders at the end of the century, built little else between 1890 and 1910. The competitive atmosphere of the times was reflected in Crampton's move into the coal trade; a contemporary guide carried an advertisement showing two of the firm's representatives emptying coal into a cellar watched by an impeccably clad maid, incongruously holding a large shovel in one hand and a lighted candle in the other.

This sorry state of affairs was, however, brightened by the presence of one firm which, while it did not by any means produce large vessels, nevertheless allowed Portsmouth at least to salvage something of its earlier shipbuilding record. Herbert Edward Vosper established a small engineering works in Broad Street in 1869 and in 1876 added yacht- and boatbuilding to his repertoire. His interest in engineering led naturally to the development of marine steam-engines and later to the production of internal combustion engines for small vessels. Five of the firm's boats were registered in Portsmouth between 1894 and 1906; typical was the 11-ton *Aorangi*, powered by an 8-hp oil-engine capable of seven knots. Edward VII used one of Vosper's boats when he reviewed the fleet off Portsmouth, an event which was followed by an order from the Royal Navy and the purchase in 1912 of Reid's yard in the Camber[43]. To break into the national market was indeed an achievement, but it could not disguise the fact that commercial shipbuilding in Portsmouth was a small-scale activity.

Lacking the stimulus of a flourishing private shipbuilding industry and unable to match the expertise of the large national companies that supplied the dockyard with plates, beams, engines, boilers, weapons and a host of other specialist components, Portsmouth's engineering and metalworking industries never really developed. A few firms, such as McKinlay at Mile End, did manufacture engines, although they were also ironfounders and by no means specialist engineers. Others, including J. W. Tout in Landport, were merely general engineers employing a dozen or so workmen. The metalworking sector was more important, for house-building created a demand for iron railings, verandahs, footscrapers, locks, bolts and nails; the associated roads provided a lucrative outlet for ironfounders like George Cash, W. H. Sperring and John Shervell whose grid-covers and lamp-posts still survive in large numbers. Theirs was a purely local market; and although the experimental work took place, and the eventual patent for the Chubb lock was taken out, in Daniel Street, Portsea, this did not give rise to lock manufacture[44].

TABLE 5

Employment in Shipbuilding and Allied Trades in Portsmouth, 1841–1911

	1841	*1871*	*1891*	*1901*	*1911*
Shipwrights	827	913	64* 2,478†	3,372	341* 2,764†
Sawyers	176	122	74	—	—
Ropemakers	183	57	33	—	—
Sailmakers	50	33	80	—	—
Platers, rivetters	—	—	—	—	857
Other shipbuilders	138	—	167	—	1,487
TOTAL	1,374	1,145	2,896	3,372	5,449
Engineers	21	373	991	2,384	3,267
Electrical engineers	—	—	79	280	929
Boilermakers	—	203	405	650	962
Blacksmiths	295	468	1,001	1,016	842
Non-ferrous metalworkers	59	90	241	250	244
TOTAL	375	1,134	2,717	4,580	6,244
GRAND TOTAL	1,749	2,279	5,613	7,952	11,693

*shipwrights in wood †shipwrights in iron and steel

(Source: *Census Reports*, Occupation Tables)

Since engineering, metalworking and shipbuilding were relatively unimportant outside the dockyard, the data provided by the census reports for Portsmouth as a whole accurately reflect changes within the yard itself. Table 5 sets out the evolution of employment in

'H.M.S. Royal Sovereign' launched at Portsmouth in 1891.
Courtesy Victory Museum, Portsmouth.

the shipbuilding trades between 1841 and 1911. The increases in total employment between 1871 and 1891 are indicative of the construction of large iron and later steel ships in the period, just as subsequent expansion in the trades shown was set in train by the capital ship and dreadnought programmes. The switch from the sail Navy to the steam Navy is seen in the demise of the sawyers, sailmakers and rope-makers; indeed those remaining in 1891 were outside the yard, and Langford's ropery in Church Street carried on until the 1930s. Wooden shipwrights lost their place to metal shipwrights; and concomitant with steam were new trades such as boilermaker, although boilers were for the most part repaired rather than made in the yard. As shipbuilding became more complex, so engineers grew in importance, and at the end of the century a new breed made its appearance, the electrical engineer, signalling the introduction of new equipment in men-of-war. A few of the electrical engineers shown for 1901 and 1911 were employed outside the yard, for in 1894 the electricity generating station was opened on the site of the Blue Bell Music Hall and of a number of houses of ill-repute. It should be observed that since this was a municipal undertaking, no profits were available for the town, although presumably Portsmouth did benefit from cheaper electric power. The vast number of craftsmen in the town at the end of the century, coupled with the small size of commercial shipbuilding, engineering and metalworking industries and the absence of links between the latter and the dockyard, emphasise the fact that Portsmouth contributed virtually nothing save labour skills to the great ships built in the town.

THE DRESS INDUSTRIES

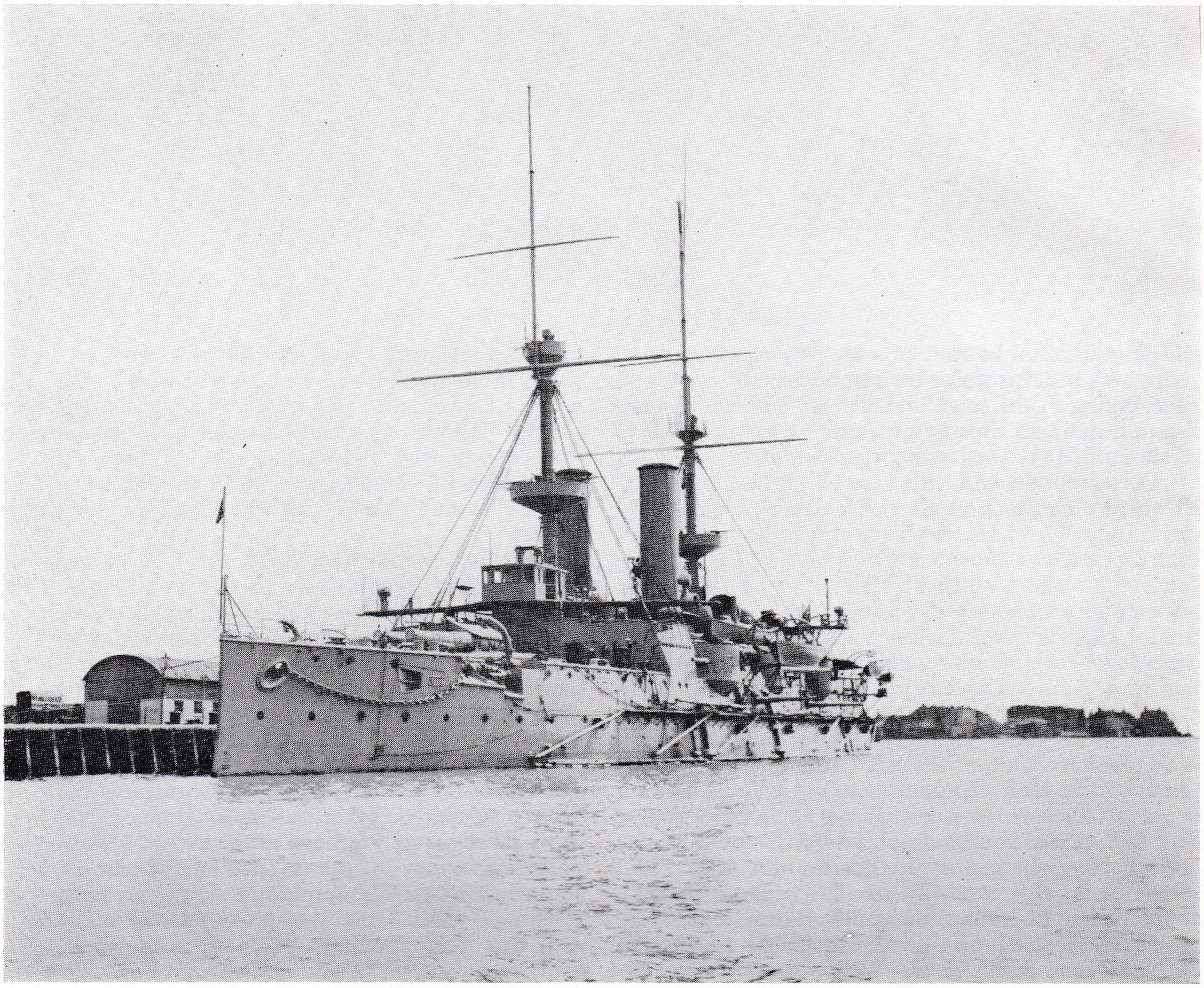
The importance of these industries has been referred to above and it suffices to repeat here that at no time between 1841 and 1911 did they account for less than 38% of Portsmouth's manufacturing employment; in 1851 the share rose to 59%. These figures represent a substantial number of people, but unlike shipbuilding, which is specific to a few towns, most of the dress industries in the nineteenth century were well developed in all towns. Therefore before it is possible to say that the dress industries were unusually developed in Portsmouth it is necessary to compare the numbers involved with those in the country as a whole. This may be done by the use of the location quotient which relates the percentage employed in, say, tailoring in Portsmouth, to the percentage employed in tailoring in England and Wales. A quotient of more than one indicates that tailoring is better developed in Portsmouth than in England and Wales as a whole, and a quotient of less than one suggests that tailoring is underrepresented in Portsmouth. The results of this exercise appear in Table 6 and support the contention that the dress industries were well developed in nineteenth-century Portsmouth. Only shoemaking, in the last two decades of the century, was underrepresented, while staymaking was between 12 and 14 times more important in Portsmouth than in England and Wales as a whole.

TABLE 6
Location Quotients for the Portsmouth Dress Industries, 1841–1891

	1841	*1851*	*1861*	*1871*	*1881*	*1891*
Dressmakers	1.18	1.72	1.48	1.32	2.57	2.59
Staymakers	14.54	15.53	13.39	12.00		
Seamstresses	10.16	5.34	2.87	2.33	2.28	1.68
Shoemakers	1.32	1.80	1.69	1.45	0.93	0.64
Tailors	1.08	1.32	1.40	1.68	1.67	1.48

(Source: Computed from *Census Reports*, Occupation Tables)

The reasons for the significance of some of the dress industries in the town are not difficult to find. Since the issue of free uniforms was not even recommended until 1858[45], the naval tailoring trade was inevitably important in a great naval port. Ratings bought their kit from the purser's slop chest until free uniforms were introduced, and it is possible that pursers bought their rough garments from tailors in the town, but officers certainly had recourse to local outfitters, some of whom established an enviable reputation. Harrod's Directory of 1865 carried an entry for Edwin and William Seagrove & Co. of 22 and 23 The Hard, subtitled 'by appointment to Her Majesty', and another for Edward Marshall Totterdell & Co. of 62 Queen Street, subtitled 'by appointment to Her Majesty's Royal Family'. The firm of Seagrove was established in 1830, and although eventually taken over by Gieve in 1904 the same site remains in use today. The origins of the firm of Gieve go back effectively to 1785 when Melchizidec Meredith opened a shop in the High Street. He seems to have been very successful for he was able to count Nelson, Rodney, Howe, Barham and even Captain Bligh among his customers. His son, Augustus, the father of George Meredith the poet, was not especially interested in tailoring and indeed was described by a friend as 'a perfect gentleman and not in the least like a tailor'.



He sold the business to a fellow High Street tailor, John Galt, who was joined in partnership in 1852 by James Gieve, to create the firm of Galt and Gieve with premises at 111 High Street. Not only did they excel in quality, but also in marketing: trade fell away to such an extent during the Crimean War owing to the absence of the fleet that a large yacht was hired and sailed for Sebastopol laden with uniforms and tailors – resourcefulness surely deserving of success[46]. In 1904 Gieve merged with two other naval and military outfitters to form Gieve, Matthews and Seagrove Ltd. Bosanquet lists some 17 outfitters who provided naval uniforms, including swords, during the nineteenth century[47], and it is noticeable that they were almost entirely located in High Street, Portsmouth and Queen Street, Portsea. An even more specialist trade was that of uniform cap-making. H. Zeffert & Son, Portsea, and John Woodhouse in High Street were the leading manufacturers. Between 1841 and 1911 employment in tailoring exhibited remarkable consistency, maintaining a share of between 6.0% and 7.7% of the manufacturing workforce; after all, both the population and the number of officers increased as the dockyard expanded.

Naval and military tailoring, by selling its products to the services, was able to do what Portsmouth's engineering and metalworking industries were unable to do, that is, benefit directly from the presence of the dockyard. A number of well-known Portsmouth families including the Galts, Gieves, Franckeisses and Totterdells, made much of their wealth from this activity. Since the number of people in the town was closely proportionate to the size of the dockyard, the non-specialist tailors were also able to benefit from the presence of the yard. Perhaps the best-known example of such a tailor was Sir John Baker who had shops in Commercial Road and in Southampton. He led a very full public life and was chairman of the School Board between 1871 and 1892 and Mayor in 1870 and 1871, served as Liberal M.P. for Portsmouth between 1892 and 1900 and among his other activities was chairman of the Portsea Island Gas Light & Coke Co. The Gieve family also served on the board of this company.

The additional market provided by the Navy and Army was the reason for the importance of boot- and shoemaking in the town, at least until 1881 when the location quotient dips below unity. The manufacture of shoes, in 1841 the leading dress industry with 14% of Portsmouth's industrial workers, exhibited an irrevocable contraction after 1851, and by 1901 could claim only 3% of the town's workpeople. It was not that the services and the townspeople ceased buying shoes, but rather that the industry became established on a mass production basis in a few towns such as Bristol, Northampton, Leicester and Norwich, causing the small Portsmouth manufacturers to go out of business. Kelly's Directory for 1895 lists only eight manufacturers, although there were many 'shoemakers' who more properly should be regarded as shoe repairers. One of the last to survive the competition of the large factories was the firm of Bishop Bros. in Commercial Road. James Bishop set up his first factory in Southampton in 1845 and did not open his branch factory in Portsmouth until 1860. The factory was typically small – it was actually above the shop – and until its demolition in 1975 the proud title 'The Steam Boot Factory' could be espied by observant pedestrians. Bishop's specialised in heavy working footwear, but ultimately manufacture became economically unjustifiable and ceased in 1905[48].

Table 6 indicates that dressmakers, seamstresses and staymakers, above all the latter, were proportionately more important in Portsmouth than in England and Wales; and indeed the three sectors collectively accounted for between 21% and 33% of the town's industrial employment between 1841 and 1901. Moreover, stay- and corset-making exhibited the kind of localisation in Portsmouth associated with carpets in Kidderminster, straw hats in Luton, shoes in Northampton and cottons in the Lancashire towns; yet curiously enough the association has never been popularly recognised, probably because it has always been easier to link Portsmouth with naval shipbuilding. The explanation of the importance of these three dress industries can hardly lie entirely in demand from the services, for while some of the shirts made were doubtless sold to sailors and soldiers, there can hardly have been a buoyant market for dresses and corsets in the Navy and Army. An important clue is to be found in the importance of female workers. Between 1841 and 1901 the three sectors employed from 70% to 83% of all women in manufacturing and there is thus good reason for supposing that the availability of female labour might be the principal influence at work. And in the nineteenth century, when there were more workers than jobs, this was used as an excuse to peg wages, making districts with surplus labour especially attractive. The question therefore is why Portsmouth should have had an abundance of women seeking work and why these women should have been employed in the dress trades.

There are many answers to the first part of the question and predictably they are all rooted in economics and in Portsmouth's role as a naval port and garrison. Firstly, pay in the dockyard, where so many Portsmouth men were employed, was lower than that in the neighbouring merchant yards in the early years of the century[49], and this would have encouraged wives to seek work. Secondly, the number employed in the yard was very much dependent on international politics, so that the workforce built up in time of war or perceived national emergency was likely to be severely pruned at the end of such events. The conclusion of the Napoleonic wars brought about immediate discharges and Slight reported that by August 1816 there was great distress in Portsea with upwards of 600 in the poor-house and 3,276 paupers outside it[50]. The contraction that went on until the 1830s has been traced above, as have the dismissals of 1868–9; other bad years for the town were 1887 and 1857, when dismissals were accompanied by a reduction in wages of those fortunate enough to be retained. In these circumstances wives could but offer to bolster family income. Thirdly, sailors' pay was too small adequately to maintain a family and ratings' wives frequently had little choice but to sell their labour. This was one of the complaints of the Spithead mutineers in 1797 and we find Father Dolling reiterating the view a century later[51]. In the early part of the century ships were paid off only in their home port, frequently after having been away for very long periods – ten years was not unusual – with the consequence that in all probability wives received nothing for extended periods. Even when regular allotments to wives were introduced, payment being made at the dockyard pay office on the production of a ticket, the system seems to have been arbitrarily executed and allotments, such as they were, were sometimes held up between one commission and the next[52]. Fourthly, since the crews of Portsmouth-based ships, especially those who were married, largely lived in the town, a disaster befalling a Portsmouth ship had severe repercussions for naval families in the town because of the absence of provision for widows. The practice was to set up a public

fund to assist widows, but the monies coming forward varied according to the extent to which a ship caught the public imagination. Only 18 of the crew of 499 of the experimental turret-ship *Captain*, which sank in 1870, were saved and in one Portsea street alone some 30 wives were widowed; however, the fund raised £57,824 by the end of the year[53]. On the other hand, the sinking of the troopship *Birkenhead* in 1852 with a loss of 436 lives resulted in a subscription of only £6,500. The distribution of the much-needed money does not seem always to have been expeditious, and Father Dolling for one was severely critical of the efficiency of the commission set up to allocate the relief funds. Fifthly, there was a sufficient number of Army families in the town for a special meeting of the Town Council to be called in 1854 to urge the government to make some provision for wives of soldiers on foreign service[54]. Clearly, it was not only dockyard and naval wives who had incentive to look for work.

That the dress industries utilised the available female labour force can be explained by a process of elimination. Women were not employed in the iron and steel, metalworking, engineering and shipbuilding industries, and in any case, apart from the latter, these activities did not develop in Portsmouth. Through lack of resources the pottery and textile industries, which did employ women, were not attracted to the town. Industries with markets restricted to the locality, brewing and baking for instance, were not in a position to expand their production. Tailoring and shoemaking were initially male domains, but the other three dress sectors not only employed women but also required no local resources, while the value of the goods made did not restrict manufacturers to local sales. Since many of the Portsmouth women seeking work were married, entrepreneurs did not always have to build factories but could simply set up a depot and require women to work in their own homes. There is considerable evidence to support the existence of such a putting-out system. A Mr. J. W. Knight of 49 Queen Street, who claimed to have introduced shirtmaking to Portsmouth, writing in *The Hampshire Telegraph and Sussex Chronicle* on 21st January 1839, refers to the ability of a woman to increase her earnings if her children could sew, and talks about family income rather than an individual's wage. Another letter in the same paper on 14th January 1839 is concerned with shirt-making being 'taken-in', while an advertisement inserted on the 18th July 1846 urges 'Six Hundred female WHITE SHIRTMAKERS and STAY STITCHERS, GORERS, etc who can have constant employment to apply at the Factory, Union Road, Landport. H. J. Hogg, Agent'. A check on the rate returns for this year indicates that there was no factory in Union Road, but that No. 15, leased by a Mr. H. Hogg from Messrs Silver, was a warehouse. Hunt's Directory for 1852 remarks that several London firms had stay warehouses in Landport, some on an extensive scale, and it certainly seems that the presence of warehouses was indicative of the existence of the putting-out system. According to Lasseter, so eager were women to obtain work that entrepreneurs were able to select those with sewing machines in their homes, even further reducing the capital required to set up in business[55]. Portsmouth must indeed have been an attractive proposition for the clothing manufacturers.

The wages paid for shirt-making, although beneficial to the manufacturers, were sufficiently low for public concern to be roused. The letter of 14th January 1839, mentioned above, refers to the 'infamous and unjustly low prices given for the work performed'. A dozen seamen's shirts would fetch a wage of 10d, giving 'the wretched females' a daily wage of perhaps 2d, compared with the London wage of 1/- per day. In refuting these charges of sweated labour, Knight claimed that a wife and two or three children should be capable of earning between 6/- and 15/- a week; however, 6/- divided by four does result in the very low wage of 1/6, while a quarter share of 15/- gives each 3/9 a week. Thus even at the higher wage, it seems likely that Portsmouth wages were lower than those in London. Knight's letter supports the contention that female labour was in plentiful supply, for he commented that 'applications for work were so numerous that we did not take on a single person without having a written recommendation from some respectable householder'. Certainly shirt-making flourished in the town in mid-century, as an advertisement in the *Hampshire Telegraph and Sussex Chronicle* on 7th October 1848 attests: 'To Shirtmakers. One Thousand first-rate Shirt hands wanted Immediately at 16, Daniel Street, Portsea'. Census data show that in 1851 some 11.5% of the Portsmouth workforce comprised seamstresses, and that the trade was five times more important than in England and Wales (Table 6). 1851 was the industry's high-water-mark, for although Portsmouth remained a specialist centre, as the location quotients indicate, the activity had shrunk to 2.5% of the industrial population by 1901. There is scant evidence to suggest that seamstresses ever left their homes and worked in

factories, and indeed the absence of the latter helps to explain the decline of the activity as other areas benefited from the economies of mass production.

Although dressmaking might have accounted for between 12% and 16% of industrial employment during the years 1851 and 1901, it was never strongly localised in Portsmouth, as Table 6 shows. Corset- and stay-making, by comparison, exhibited truly remarkable concentration in the town even though it was not until the latter part of the century that it could claim an important share of factory employment. In 1901 stay-making had 11% of the workforce compared with 14% in dressmaking. But while dressmaking was important in all towns, stay-making was important only in Portsmouth. The origins of the industry are obscure, although they may lie in sail-making, in many ways a similar activity. It can only be hypothesised that a number of manufacturers, benefiting from cheap female labour and the putting-out system, were able to capture markets outside the town. This must have occurred prior to the 1841 census when the activity was already 14 times more significant than in England and Wales. Considering that the railway did not reach Portsmouth until 1847 and that goods had to be dispatched by packhorse, this was a considerable achievement.

The Post Office Directory for 1847 lists 21 stay-makers. The rateable values for the properties concerned range from £4-10-0 to £54, the two most valuable belonging to William Helby (£45) and James William Chilcot. Helby's property is described as a house although it could have been used as a warehouse; Chilcot's premises are entered as house and warehouse. Even if both were used in part as factories they were small by comparison with many other non-dockyard establishments: three breweries had values in excess of £200. The 1847 rate returns describe only one property as a stay factory, that belonging to Robert Pearce in Great Charlotte Street, with a value of £9, indicative of the size of enterprise in the industry at the time. Although they were slow to appear and many were small, the early stay factories at least ensured that the initial advantage held by Portsmouth was not lost to other towns as happened in shirt manufacture. Typical was the evolution of the firm of Chilcot and Williams. Chilcot and Thomas Roger Williams both began in a small way and it was not until their partnership in the late 1850s and the opening of their Surrey Street factory in 1861 that they became notable manufacturers. They quickly began to sell their goods throughout Britain and abroad, at the same time taking out patents on their designs. In 1869 they were accused by Edwin Izod & Co. in Great Charlotte Street of infringing one of the Izod patents, and successfully defended their case; here were two Portsmouth firms with national patents to their credit and both with a national reputation, unlike the majority of undertakings in the town. Nevertheless, in spite of extensions effected by A. Grant & Co., engineers of Arundel Street, the Surrey Street factory was only rated at £68 in 1865[56].

The following decades were ones of considerable expansion. Between 1861 and 1901 the number of stay-makers rose from 597 to 2,288, increasing still further to 2,896 in 1911. In the process the industry became firmly established on a factory basis and one company in particular seemed to spawn branch plants and competitors. Leethem Reynolds began with a small workshop in Canal Walk in 1844. He was joined by his brother Thomas and later by Matthew Totterdell, but Totterdell resigned from the company taking one of the firm's best men, Royal, with him to set up their own firm in Buckingham Place. Reynolds established his nephew, Charles Leethem Reynolds, in a much expanded Canal Walk factory in 1877 and by 1885 had branch plants at All Saints Road and Common Street. There was also a stay factory in Grosvenor Street run by a Henry Leethem, presumably another member of the family. In spite of the national importance of Portsmouth stay manufacture, the factories themselves were not large. There were eight Portsmouth factories (all breweries) whose rateable value in 1885 was higher than that of the largest stay factory, Leethem Reynolds at All Saints Road with a value of £260. However, seven stay factories had a rateable value in excess of £100, and another, Chilcot and Williams, had a value of £87. Their rateable values may have been smaller than those of the breweries but the stay factories were much more labour-intensive and employed very many more people.

The last years of the century saw the consolidation of Portsmouth's most specialised industry, and there is no reason to suppose that events in the majority of firms were fundamentally different from those at Chilcot and Williams. Designs were registered at the Design Office, new patents were taken out both in London and in Brussels, for Belgium herself had an important corset industry, orders were received from the U.S.A. and France, business flourished and the factory was extended. A number of new names appeared among the ranks of the larger companies. One was Charles Bayer whose products were marketed

Dock Mill, Southsea, at the turn of the century.
Courtesy Portsmouth City Museums.

under the trade name 'CB' and were sufficiently renowned to be the butt of music hall jokes. He was apparently no respecter of patents, for he borrowed an American design known as 'Erect Form' only to lose the ensuing litigation[57]. His Regent Street factory, with a rateable value of £289 in 1901, was second largest to Leethem Reynolds's All Saints Road plant, valued at £369. Another new name was that of William Fletcher whose Landport Street factory was the third largest in the town in 1901. Originally a factory manager, he went into business on his own in Lawrence Road and later expanded at Landport Street. He tried to imitate Charles Bayer's ploy of selling direct to retailers but badly underestimated the costs involved, went bankrupt in 1904 and was bought out by Charles Leethem. A third new firm, if not name, was Royle & Co., Royle's partnership with Totterdell having been dissolved. Of the 40 factories in Portsmouth with a rateable value exceeding £100 in 1901, the brewers could claim 13 and the stay manufacturers 9, some 6 breweries and the Cooperative Society bakery being larger than the All Saints Road stay factory.

Corset manufacture gave rise to a number of associated activities such as engineering (the use of the firm of Grant by Chilcot and Williams has been noted), the production of cardboard boxes by firms like Arthur Coomer, who was attracted to Portsmouth specifically because of demand from stay manufacturers, and the production of spring steel for corsets by the Ellarkose Steel Co., controlled by Leethem Reynolds. These were the kind of links which were absent between the dockyard and the town but compared with naval shipbuilding, corset manufacture was of meagre size and on its own it could generate only limited wealth for the town.

FOOD AND DRINK

Baking, confectionery manufacture, flour milling, brewing and soft drink production together represented the third most important industrial group in nineteenth-century Portsmouth. It was a poor third, however, for its share of industrial workers fluctuated between a mere 5.5% and 7%, bakers and confectioners alone accounting for between 4% and 5%. The bakers and confectioners were involved in the retail trade but are classed as manufacturers since they produced goods in their ovens behind the shop. They proliferated as the town's population grew and apart from the very large bakery, with the fifth largest rateable value (£457) in 1901, operated by the Portsea Island Mutual Cooperative Society in Fratton Road in the last years of the century, bakeries remained small. Even Smith and Vosper's bakery in Green Road had a rateable value of only £68 in 1901. The all-pervading influence of the dockyard did not neglect this workaday trade, for since Elizabethan times there had been one or more naval bakehouses in the town; in 1724 such an establishment was opened in King Street to make 34 cwt of biscuit a week[58]. This bakehouse was the scene of ingenious but insufficiently secret graft, for the bakers invested in pigs that inevitably grew prosperously fat on ships' biscuit. The discovery of their enterprise was in part responsible for the transfer of the bakery to Weovil at Gosport in 1828; the ovens used there may still be seen in what is now Royal Clarence Yard. Apart from William Miller (Campion's after 1926) who had successive bakeries in Havant Street, Cross Street and in 1892 in Kent Street, and who held the naval canteen contract[59], Portsmouth master-bakers had little opportunity of supplying the Navy. After 1828 the town lost even the benefit of the wages of the men employed in the naval bakehouse.

Wind- and water-powered flour mills, by virtue of their architecture, were striking buildings but their labour requirements were modest so that between 1841 and 1901 milling declined from a mere 0.5% to 0.1% of the industrial workforce. Portsea Island did not possess a single steam-powered mill but in King's Mill, at the head of the Mill Pond between Portsea and Portsmouth, it had a tide-mill, its wheel operated by the fluctuations in sea-level. The mill was purchased by the Crown in 1714 and was used to supply the naval bakeries with flour, of which half a ton a week could be ground. A fire destroyed the mill in

Pike Spicer's Penny Street brewery, from Alfred Barnard, 'The Noted Breweries of Great Britain and Ireland', 1891.
Courtesy Portsmouth Reference Library.

1868 and in 1876 the Pond was filled in. The 1847 rate returns indicate the existence of Queen's Mill in Portsmouth; although it was the fifth largest industrial property at the time it was probably used as a store-house rather than as a working mill. In the early part of the century the town was strong in windmills, boasting eight in all. Five were bunched together between Flathouse and Rudmore, and the other three – Dock Mill, Ballard's Mill on the site of the present Queen's Hotel, and Lumps Mill – were in Southsea. The largest of the windmills was Dock Mill which had a rateable value of £204 in 1885 making it the thirteenth largest factory in that year. Dock Mill owed its origin to the formation in 1796 of the Union Society, perhaps the first cooperative society in England, by a group of dockyardmen wishing to provide themselves with cheap flour. A windmill was constructed on the shoreline immediately to the east of the yard fortifications but the Board of Ordnance commandeered the site in 1816 to extend the latter, although ironically the Old Dock Mill was still standing in 1850. Undeterred, the dockyardmen formed the Dock Mill Society and in 1817 built Dock Mill in what is now Napier Road, Southsea. It was demolished in 1923[60]. One steam-powered flour-mill, Landport Steam Flour Mills, did make an appearance in the town[61]. Located in Lake Road and worked by George Curtis until 1900, it was smaller than Dock Mill despite the use of steam power and had a rateable value of £150 in 1885.

Public-houses have the reputation of being exceptionally numerous in Portsmouth, and indeed since sailors and soldiers appear to experience inordinate thirsts, it is not altogether surprising that enterprising individuals should have wished to profit thereby. The town's brewing capacity has therefore not been uninfluenced by the naval and military presence[62]. This seems particularly to have been the case earlier in the nineteenth century when retail brewers swelled the ranks of the larger wholesale brewers. Pigot's National Commercial Directory of 1830 lists 18 retail brewers, although this is probably an underestimate. In any event the 1841 location quotient for the activity was 3.17, indicating that brewing was three times more important in Portsmouth than in England and Wales as a whole. However, the location quotient dropped consistently to reach 1.27 by 1891, a trend reflected in brewing's share of Portsmouth's employment which fell from 1.6% in 1841 to 0.9% in 1901. The retail brewers gradually went out of business, as did the smaller wholesale producers, with the consequence that by the end of the century there remained a few large firms which by dint of the efficient deployment of their workers were able to obtain a large output from a relatively modest number of employees. One should not therefore be surprised by the high rateable values attaching to breweries but that breweries were the largest industrial premises in Portsmouth does require explanation.

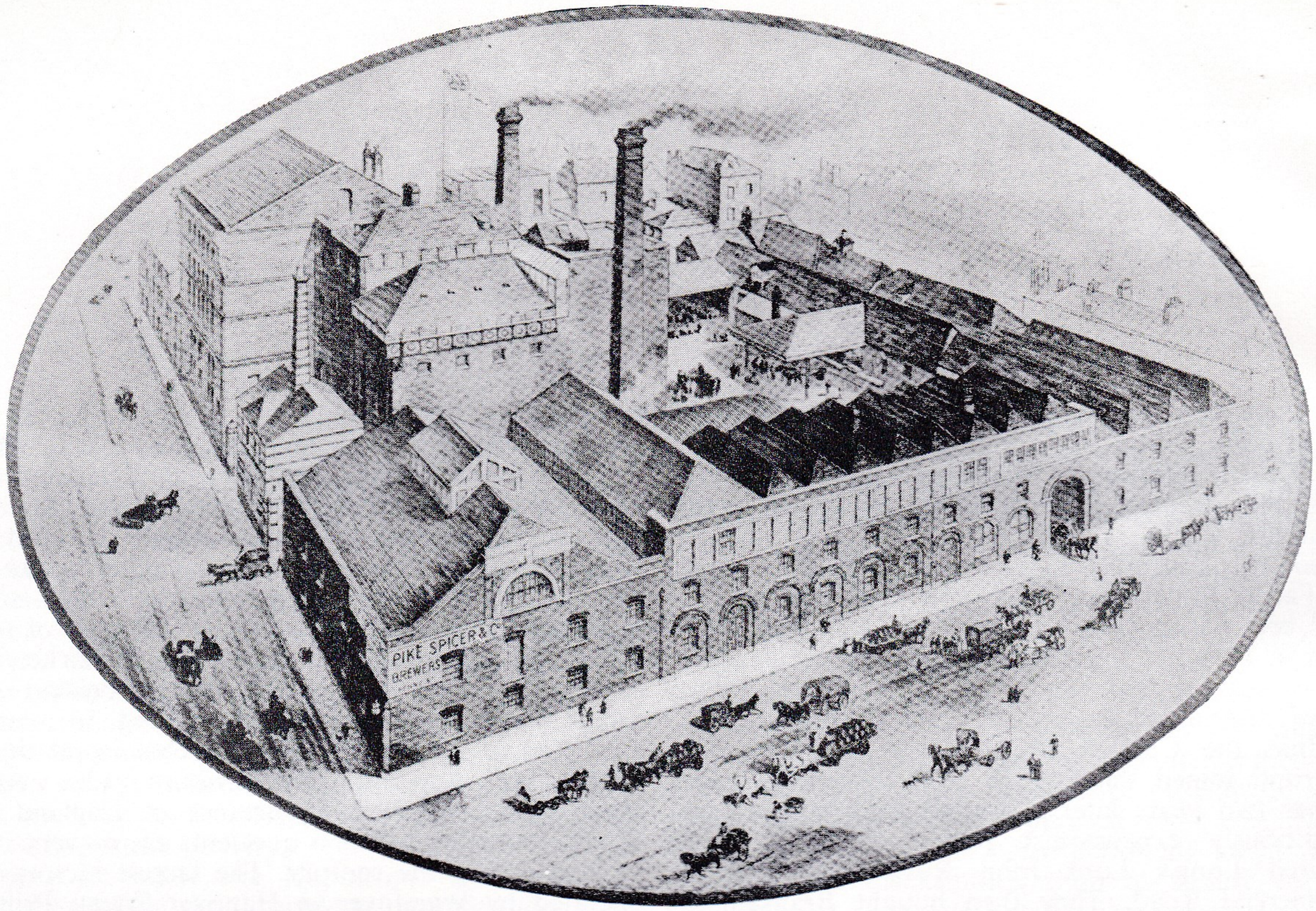
TABLE 7
Rateable Values above £99 for Breweries* and Other Manufacturing Premises

	£100–£200		*£201–£300*		*£301–£400*		*> £400*		*Total*	
	*Br.**	*Other*	*Br.**	*Other*	*Br.**	*Other*	*Br.**	*Other*	*Br.**	*Other*
1847	1	2	1	–	2	–	–	–	4	2
1865	2	2	–	–	2	1	–	–	4	3
1885	3	13	2	5	4	–	2	–	11	18
1901	6	13	1	11	1	1	6	1	14	26

(Source: *Rate Returns*)

It is clear from Table 7 that in both 1847 and 1865 there were more breweries than other factories with rateable values of £100 and above. In 1847 the two Carter breweries in Penny Street and in St. George's Square had values of £337 and £304 respectively, and Garrett's Penny Street brewery was valued at £297. The next largest manufacturing plant was the Flat-house gasworks, rateable value £150. The total domination of breweries was weakened in 1865 by the appearance of the Camber Dock workshops in the returns with a value of £400, higher than both Penny Street breweries. By 1885 breweries were outnumbered overall since the industrialisation process, led by stay manufacture, was then in full swing but nevertheless all the factories with values above £300 were breweries. These were: Pike Spicer in Penny Street (£630), Tessier in Penny Street (£450), Jewell in Catherine Row, Portsea (£400), Miles in King Street (£352), Long in Hambrook Street (£348) and Lush in St. George's Square (£331). Only the Co-operative Society bakery (£457) could stand comparison with the biggest breweries in 1901, but even so there was still a substantial differential as the data indicate: Brickwood in Catherine Row (£1,050), Long (£1,020), Brickwood in Penny Street (£780), Pike Spicer (£740), Lush (£446) and Young in Thomas Street (£440).

The manner in which breweries held sway over the other industries must have led some into thinking that Portsmouth was a veritable Burton-on-Trent, but although the location quotients indicate specialisation in the activity, it was nothing like that in stay-making. The importance of brewing rateable values was in reality the result of two factors. Firstly, outside the dockyard there was but one well-developed



industry – corset and stay manufacture – organised on a factory basis. Other numerically important activities, such as the other dress trades, were largely based on small workshops and domestic premises. Secondly, corset and stay manufacture was essentially labour-intensive so that one small factory would employ many times the number working in the largest breweries, which were extravagant users of space and therefore attracting high rateable values. It should be observed that the importance of brewing had nothing to do with sales to the fleet. For once a technical matter was responsible for the absence of links between a Portsmouth industry and the dockyard; beer does not keep well and was thus not worth taking on more than the shortest commissions. When ashore, however, sailors did their utmost to match the town's brewing capacity. In 1901 11,977 were so stationed and there were 2,490 soldiers to assist them.

Until the growth of the stay factories, brewing was virtually the only manufacturing activity capable of generating wealth in the town, although its presence did not lead to the growth of linked industries. William Pike (1691-1777), whose brewery was in Penny Street, was one whose business was handsomely profitable but, unfortunately for Portsmouth, he invested in property on the Isle of Wight at Brading, Sandown and Shanklin. His daughters married into the Carter and Bonham families and the Carters continued to expand the brewery while the sons of his partner Samuel Spicer bought Temple's brewery in St. George's Square in 1801. On David Spicer's death in 1840 this brewery came into the hands of the Carters who then possessed the two largest factories in Portsmouth, and began to trade as Pike Spicer & Co. Small wonder that the family was sufficiently wealthy to go into politics, both local and national[63]. The St. George's Square premises were subsequently sold to I ush & Co.

There were a number of breweries which expanded with remarkable speed during the century. One such brewery was owned by J. J. Young, whose premises were valued at a mere £41 in 1865 but were the seventh most highly rated manufacturing establishment in Portsmouth in 1901. Another was Long's brewery. The premises were not acquired by the Long family until 1851 but although Edwin Searly Long contrived to make it the fourth largest brewery by 1865, his son, Charles E. B. Long, greatly expanded the business by virtue of very early entry into bottled beers which he sold as far away as Cardiff, Birmingham and Norwich[64]. By 1901 Long's was the second largest manufacturing plant in Portsmouth. A third enterprising company was Portsmouth United Breweries, although it has to be said that since it was not formed until 1896 it made little mark upon the nineteenth century. The firm was the work of William Thomas Dupree (1856–1933) who bought Dean's Steam Brewery at Cosham and merged it with Stannard's Beehive Brewery in Warblington Street and with Miles's Elm Brewery. The first two breweries

were then sold and production concentrated at the Elm Brewery, which had a rateable value of £360 in 1901. Shortly afterwards, Bransbury's Crown Brewery in Church Street and the firm of Lush & Co. were acquired[65].

Pride of place must, however, go to Brickwood & Co. Fanny Brickwood bought the Cobden Arms, a small brewery in Arundel Street, in 1851. After her death in 1854 her son Harry carried on but in 1862 he died leaving two young sons, Arthur and John. Arthur, after an education in Germany, itself suggesting that the Cobden Brewery was anything but bankrupt, joined the firm in 1870 followed by his brother two years later. Together they pursued an expeditiously expansionist policy. In 1874 they acquired Long's Lord John Russell Brewery in Commercial Road. They then bought Bransbury's brewery in Hyde Park Road in 1880, although not without financial difficulties for their bank had severe misgivings about the breakneck speed of their growth; by 1885 their brewery was the eighth largest in Portsmouth. 1887 saw them moving to Penny Street where they bought Tessier's brewery, the second largest in the town, but bedevilled by problems of expanding the site they bought Jewell's brewery in 1899 and two years later the premises had the highest rateable value in Portsmouth. Subsequently, in 1910, Pike Spicer came under their aegis. Thus in the space of 40 years Brickwoods had overtaken and consumed Portsmouth's premier brewery; in 1933 they swallowed Long's and in 1953 Portsmouth United Breweries as well[66]. Wealthy though the brewing families became, their affluence failed to generate local manufacturing for, to be fair to them, had they tried to control their sources of material supplies they would have invested in barley and hop farms, not in manufacturing industry.

OTHER INDUSTRIES

It will be recalled from Table 1 that industries outside shipbuilding, metalworking, engineering, dress and food and drink accounted for barely more than 13% of the manufacturing workforce. In reality this figure is too high for it includes factory labourers, machinists, mechanics and artizans who could not be allocated to a specific industry by the census. For example, these classes accounted for 8% of industrial labour in 1891 so that 'other industries' were collectively unimportant. Only two, furniture production and printing, continuously employed slightly more than 1% of the workforce between 1841 and 1901. Of the others, brickmaking fluctuated about the 1% mark and coachbuilding fell between 0.5% and 0.8%. Other activities were insignificant, even though they may have been represented by medium-sized factories such as the chemical industry which included the Doudney soap factory, Stephenson's paint works and White's dyeworks, or the gas industry with a single plant at Flathouse. A general characteristic of these industries was their dependence on local markets and indeed they were largely activities associated with urban areas, their employees varying in number according to the size of the town. Thus in relation to Portsmouth's population the furniture trades were an exact replica of their importance in England and Wales, returning location quotients of, or very close to, one during the century. The largest factory was operated by Wendover in Hanover Street. Printing employed fewer than furniture manufacture and consisted of a small number of medium-sized establishments such as the *Mail* and *Evening News* printing works, and a number of small firms such as Charpentier, Chamberlain and Winterbottom & Sons. The abundance of clay allowed builders to make their own bricks using the simple clamp method, and as the housing frontier marched northwards so did these small brickworks. Two brickworks were of a larger scale, one a short-lived enterprise operated by 600 convicts making bricks for the Dockyard Extension and capable of producing 20 million bricks a year in five Hoffmann kilns, and the other at Burrfields, opened in 1890. Burrfields bricks were used for the Officers' Mess at H.M.S. *Nelson*, the Queen's Hotel and many Portsmouth churches and schools. The foremost coachbuilding firms were Linnington Bros. and Alfred Reading; the former exhibited a carriage at the Great Exhibition and exported a number of gigs to Barbados, but in the main the company's market was a local one. Since these activities failed to penetrate national markets they did not rise above the level of importance to be expected in a town the size of Portsmouth, and the investment generated was of modest proportions.

CONCLUSION

That nineteenth-century Portsmouth was a naval town is an undisputed fact, but the manner in which the tentacles of the Navy and the dockyard extended into every branch of manufacturing has largely been under-estimated, if not ignored. Portsmouth represents a classic case of a town whose leading manufacturing sector, naval shipbuilding, generated neither

local support industry nor capital, owing to a combination of the policy of self-sufficiency pursued by the dockyard and the inability of local industry to compete with the great iron and steel and engineering districts of Great Britain for supply contracts with the yard. The second most important industry, 'dress', while not linked to shipbuilding itself, nevertheless owed its existence to the presence of large numbers of sailors' and soldiers' wives in receipt of pitifully small allowances when their husbands were away. Since they were heavily dependent on labour rather than material supplies, the dress industries could do little to engender manufacturing in the town. Other industrial activity was simply concerned to meet the needs of servicemen and the population of the town which grew up in the shadow of the dockyard. Horne was referring to post-Napoleonic Portsmouth when he remarked that 'from the richest landowner to the poorest beggar in the streets, all were dependent, directly or indirectly, upon money derived from Government contracts or Government service'[67]. This paper has attempted to demonstrate that the observation has no less validity for the whole spectrum of manufacturing during the entire nineteenth century.

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REFERENCES

1 Kelly & Co., *Post Office Directory of Dorsetshire, Wiltshire and Hampshire including the Isle of Wight*, 1867.

2 P. Christie, *Occupations in Portsmouth, 1550–1851*, M.PHIL. Portsmouth Polytechnic (forthcoming).

3 C. Booth, 'Occupations of the People of the United Kingdom, 1801–1881', *Journal of the Statistical Society*, 49, 1886, 314–444.

4 W. A. Armstrong, 'The Use of Information about Occupation, Part 2, An Industrial Classification, 1841–91', in E. A. Wrigley (Ed.), *Nineteenth Century Society. Essays in the Use of Quantitative Methods for the Study of Social Data*, Cambridge, 1972, 230–88.

5 Portsmouth and Portsea Literary and Philisophical Society, 'Statistics of the Island of Portsea', *Journal of the Statistical Society*, 16, 1853, 218.

6 Ivor E. King, 'Forty Years of Change at Portsmouth Dockyard with some Notes on Dockyard Organisation', *Transactions of the Institute of Naval Architects*, 97, 1955, 396.

7 Robert Sutherland Horne, *HM Naval Base Portsmouth. A Description of Some of the Historic Buildings in the Conservation Area*, 1975, 3–4.

8 Navy Papers Presented to Parliament, 1802, quoted in K. Harrison, *The Important Social Consequences of the Development of Portsmouth Dockyard during the Seventeenth and Eighteenth Centuries*, Portsmouth College of Education, 1974, 37.

9 N. McLeod, 'The Shipwrights of the Royal Dockyards', *The Mariner's Mirror*, 12, 1926, 277.

10 *Horne Papers*, 81, deposited in Portsmouth Record Office.

11 L. G. Carr Laughton, 'Maritime History', in *The Victoria County History of Hampshire and the Isle of Wight*, 5, London, 1912, 398.

12 *Horne Papers*, 49a, unpaginated page facing 51.

13 *Ibid.*, unpaginated page facing 51c.

14 From a plan, Public Record Office, ADM 140, quoted in *R. S. Horne Papers*, unpaginated page following 51c.

15 Letter from Navy Board dated 5th August 1802, Public Record Office, ADM 106/2539.

16 *Horne Papers*, 61a.

17 Lady Bentham, 'Observations on Portsea and Portsmouth Dockyard', *Journal of the Statistical Society*, 16, 1853, 360.

18 Letter from Navy Board dated 14th September 1805, Public Record Office, ADM 106/2539.

19 Public Record Office ADM 106/2539.

20 R. C. Riley, 'Henry Cort at Funtley, Hampshire', *Industrial Archaeology*, 8, 1971, 69–76.

21 Public Record Office, ADM 106/2539.

22 K. R. Gilbert, *Henry Maudslay, Machine Builder*, Science Museum, 1971, 19.

23 K. R. Gilbert, *The Portsmouth Blockmaking Machinery*, Science Museum, 1965.

24 Portsmouth and Portsea Literary and Philisophical Society, *op cit.*, 211–2.

25 *Ibid.*, 213.

26 Lady Bentham, *op. cit.*, 357.

27 A. J. Marsh, unpublished notes on Portsmouth Dockyard.

[28] A. J. Holland, *Ships of British Oak. The Rise and Decline of Wooden Shipbuilding in Hampshire*, 1971, 191.

[29] Navy Board Visitation, 20th September 1813.

[30] Portsmouth and Portsea Literary and Philosophical Society, *op. cit.*, 219.

[31] *Horne Papers*, 87, 91F.

[32] *Ibid.*, 90A.

[33] F. N. G. Thomas, *Portsmouth and Gosport. A Study in the Historical Geography of a Naval Port*, M.Sc., University of London, 1961, 75.

[34] L. G. Carr Laughton, *op. cit.*, 403.

[35] Sir R. Vesey Hamilton (Ed.), *Letters and Papers of Admiral of the Fleet Sir Thos Byam Martin*, 1902, chapter 3, quoted in Marsh, *op. cit.*

[36] *Horne Papers*, 86.

[37] William G. Gates, *The Portsmouth that has Passed*, c. 1942, 319.

[38] William G. Gates, *Records of the Corporation, 1835–1927*, 1928, 63.

[39] Thomas, *op. cit.*, 130–1.

[40] William G. Gates, *Portsmouth Through the Centuries*, 1931, 90.

[41] Professor A. Temple Patterson, *'Palmerston's Folly': the Portsdown and Spithead Forts*, Portsmouth Paper No. 3, 1967, 16–17.

[42] Thomas, *op. cit.*, 175.

[43] Anon, 'Vosper Ltd.', *Port of Portsmouth, Chamber of Commerce Journal*, 12, 1958, 23–5.

[44] William G. Gates, *Records of the Corporation, 1835–1927*, 1928, 234.

[45] Christopher Lloyd, *The British Seaman*, 1968, 274.

[46] Anon, 'Hampshire Firm is World's Largest Bespoke Tailor', *Hampshire*, 3, No. 1, 1962, 6.

[47] Capt. Henry T. A. Bosanquet, *The Naval Officer's Sword*, H.M.S.O., 1955.

[48] Anon, 'Bishop Bros', *Port of Portsmouth, Chamber of Commerce Journal*, 11, No. 10, 1957, 29, 31.

[49] Holland, *op. cit.*, 56–7.

[50] H. and J. Slight, *Chronicles of Portsmouth*, 1828, 230.

[51] Robert R. Dolling, *Ten Years in a Portsmouth Slum*, 1903, 108–9.

[52] R. Taylor, 'Manning the Royal Navy: the Reform of the Recruiting System, 1852–62', *The Mariners' Mirror*, 45, 1959, 50.

[53] William G. Gates, *Illustrated History of Portsmouth*, 1900, 622.

[54] William G. Gates, *Records of the Corporation, 1835–1927*, 1928, 71.

[55] W. Lewis Lasseter, 'The Portsmouth Corset Industry. Its Origin and Growth', *Port of Portsmouth, Chamber of Commerce Journal*, c. 1945, no pagination.

[56] Chilcot and Williams Ltd., Deposited Papers, Portsmouth Record Office.

[57] Lasseter, *op. cit.*

[58] William G. Gates, *Portsmouth Through the Centuries*, 1931, 114.

[59] Anon, 'Campions (Bakers) Limited', *Port of Portsmouth, Chamber of Commerce Journal*, October 1956, 15.

[60] Robert Sutherland Horne, 'Britain's First Coop in Portsmouth?', *Hampshire*, March 1969, 29–30.

[61] M. D. Freeman, 'Milling Capacity in Portsmouth c. 1650–1914: Testing an Hypothesis by I.A.', *Industrial Archaeology*, 11, No. 2, 1974, 58.

[62] M. Bateman (Ed.), *Atlas of Portsmouth*, 1975, plate 3.6(d).

[63] Alfred Barnard, *The Noted Breweries of Great Britain and Ireland II*, 1891, 160–82.

[64] *Portsmouth Evening News*, 23rd February 1933.

[65] M. Olding, *Portsmouth and the Brewing Industry with a History of the Portsmouth United Breweries Ltd. 1896–1933*, Portsmouth College of Education, 1975, 10–20.

[66] Anon, 'The Brickwood Story', *The House of Whitbread*, Spring-Summer 1960, 26–9.
Anon, 'The History of Brickwoods', *Trade Winds*, December 1969, 19–21.

[67] *Horne Papers*, 93.

The Portsmouth Papers—Titles available

1. *Portchester* by Professor Barry Cunliffe, 1967 (Illus.) 37p. *Reprinted* 1970.
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Borough Sessions Papers 1653–1688 by Arthur J. Willis and Margaret J. Hoad, MA, 1971 (Illus.) £4.25.

Portsmouth and Sheet Turnpike Commissioners' Minute Book 1711–1754 edited by W. Albert and P. D. A. Harvey, 1974 (Illus.) £6.00.

Other publications available

Fortifications in Old Portsmouth by A. Corney, 1965 (Illus.) 10p.

Southsea Castle by A. Corney, 1967 (Illus.) 5p.

The Civic Plate and Insignia of the City of Portsmouth (reprinted from the Connoisseur) by Sir C. Oman, 1965, 13p.

Guide to Historic Portsmouth (in colour) 13p.

Records of the City of Portsmouth 1835–1955 (Bound and Illus.). In five volumes, each £2.50. *1956–65* (Bound and Illus.) £3.75.

New Publication

Buildings of Portsmouth and its Environs by D. Lloyd, 1974 (Bound and well illustrated) £6.

Copies of these publications are obtainable from the City Secretary and Solicitor, Guildhall, Portsmouth PO1 2AL and the Central Library and Museums.